Summary of Draft vs. Final USGS Fish and Habitat Report Results and their application to SWMI

Description of Preliminary vs. Final Procedures and Results

Variables Evaluated in Preliminary Study: In order to meet an accelerated schedule at the request of the SWMI process, the preliminary (accelerated) study relied on best professional judgment and literature review to choose a small subset of variables to test for their influence on fish communities.

- Preliminary Results: Impervious cover and net estimated August median flow alteration were the two human-influenced variables that were found to have a significant influence on fish communities. Net estimated August median flow alteration is a combined metric that includes groundwater withdrawals, and septic, NPDES and groundwater returns and was readily available from the MWI study. Four natural variables (channel slope, percent wetland, drainage area and east/west location) were also found to have a significant influence on fish community composition.

Variables Evaluated in Final Study: The Final study looked at a much broader list of variables that could potentially influence fish communities, further described below.

- Combined vs. individual flow alteration components: Instead of using net August alteration, which is a combination of withdrawal and return data, each component of net alteration was tested individually for significance. Specifically, net alteration is calculated by starting with estimated unimpacted flows, subtracting groundwater withdrawals and adding back in septic returns, NPDES returns and groundwater discharge returns. The preliminary study looked at the combined effect of these variables (i.e., the net), while the final study tested each variable independently.

- Testing Process: More than 150 flow, land use, and landscape variables were tested for inclusion in the modeling effort. A statistical method (Principal Components Analysis-PCA) was used to determine which of these explained the most variability in the dataset. Correlation tables were developed to examine which variables were highly correlated with each other. It is not appropriate to use multiple highly correlated variables in the same model. PCA identified impervious cover as the first (strongest) variable to come into the model. Subsequent variables were likewise selected based on the results of the PCA and the correlation to other variables already selected. PCA results indicated that septic returns were a strong variable, but septic was too highly correlated to be included in the same model as impervious cover. The PCA results indicated that NPDES returns did not contribute significantly to the fluvial fish relative abundance model at the statewide scale. Estimated August median flow alteration resulting from groundwater withdrawals was both significant and not highly correlated with other variables in the model. August Net Flow Alteration, the variable used in the

preliminary report, was not as strong a variable as August Groundwater Withdrawal Percent, according to the PCA analysis.

- Final Results: In this analysis, the best model explaining the relationship between human alteration variables, landscape variables, and fluvial fish abundance included impervious cover, estimated August median flow alteration resulting from groundwater withdrawals, channel slope, and wetlands buffer area.

Biological categories and flow levels were revised based on the final report results described herein, and are shown in Attachment A, Tables 1, 2 and 3, and Figures 2 and 4. The "old/draft" biological categories and flow levels are also shown in Tables 1 through 3 and Figures 1 and 3 to allow comparison.

Attachment A

Table 1: Comparison of old vs. new flow levels for all 1395 subbasins

A	B	C	D	E	F	G
Flow Level (FL)	Old FL cutoffs (August net, positive or negative)	Old total number of subbasins per FL	Old % of subbasins per FL	New FL cutoffs (Aug GW reductions only, zero or negative)	New total number of subbasins per FL	New % of subbasins per FL
1	0 to 5	781	56%	0 to -3	478	34%
2	5 to 15	237	17%	-3 to -10	390	28%
3	15 to 35	188	13%	-10 to -25	226	16%
4	35 to 65	85	6%	-25 to -55	170	12%
5	>65	104	7%	> -55	131	9%
	totals:	*1395*	*100%*		*1395*	*100%*

Table 2: Comparison of old vs. new flow levels separating out subbasins that were previously classified as surcharged or depleted

H	I	J	K	L
Flow Level (FL)	Old distribution for reduced subbasins	New distribution for reduced subbasins	Old distribution for surcharged subbasins	New distribution for previously surcharged subbasins
1	546	272	235	206
2	106	216	131	174
3	94	137	94	89
4	52	131	33	39
5	75	117	29	14
	873	*873*	*522*	*522*

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Table 3: Comparison showing the distribution of "old" biological categories based on the preliminary results and "new" biological categories based on the final results

Bio Cat (BC)	Old distribution	New distribution	change
1	81	86	+5
2	102	235	+133
3	201	278	+77
4	218	325	+107
5	776	454	-322

Figure 1: Draft “old” Biological Categories using preliminary USGS results

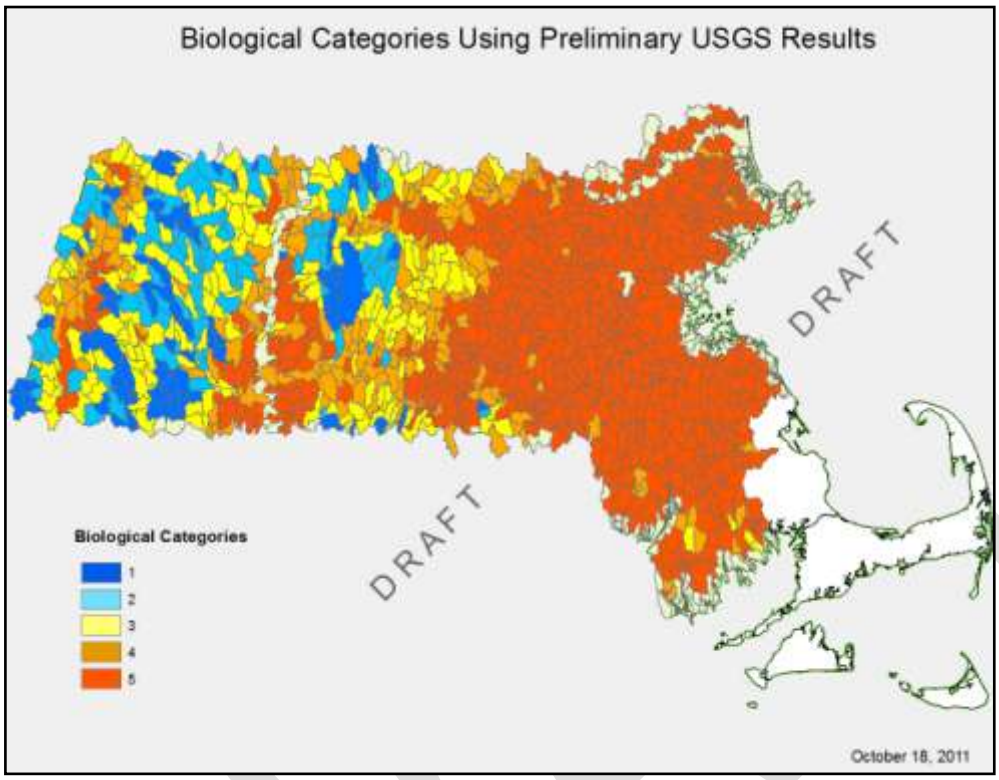

Figure 2: Draft “new” Biological Categories using final USGS results

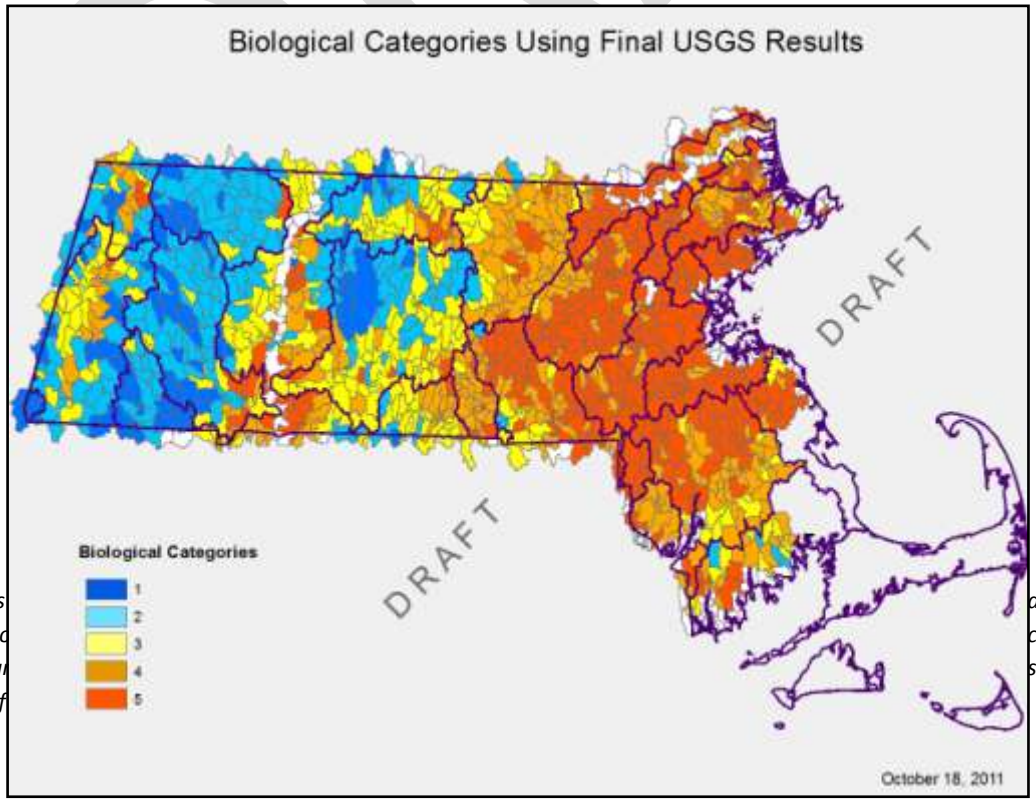

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Figure 3: Draft “old” Flow Levels using preliminary USGS results

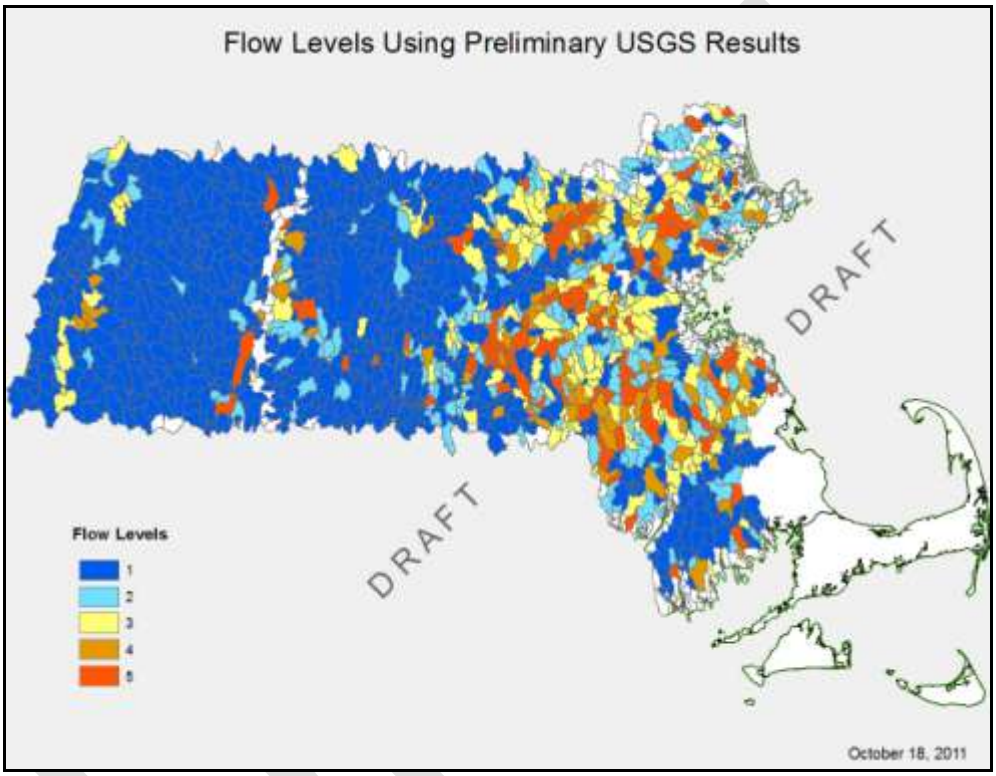

Figure 4: Draft “new” Flow Levels using final USGS results

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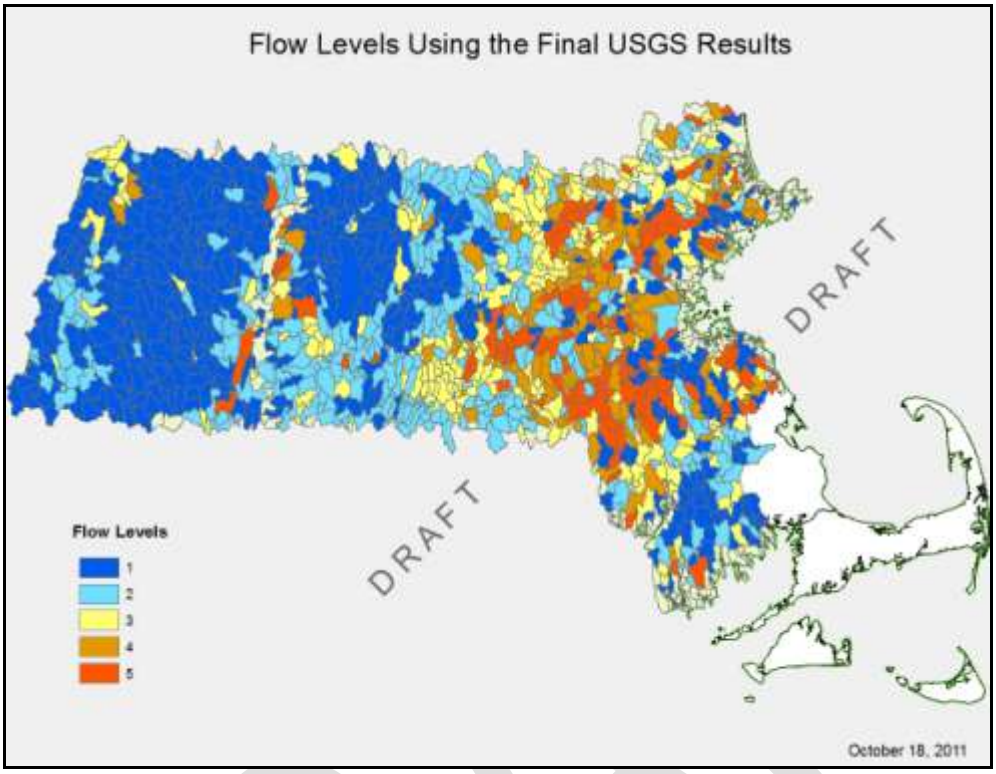

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